Dam Safety Program

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Dam Safety Program (DSP) Project Description

This project provides for all activities directly required to carry out the District's Dam Safety Program, which will ensure the safe performance of the District's 11 aging dams. This is a continuing operation required for the lifetime of the dams.

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DSP Justification and Goals

Executive Limitation Policy EL-7, Asset Protection, notes that "The CEO/GM shall not allow corporate assets to be unprotected, inadequately maintained or unnecessarily risked." Ends Policy E-2, Board Direction to the CEO/GM, 2.1, states "There is a reliable supply of healthy, clean drinking water." The Dam Safety Program specifically addresses both the protection of assets and the reliability of the water supply.

Why complete the DSP Report?

1) The report formalizes in writing a new state–of-the-art methodology for dam safety by the District.

2) The report documents 28 years of research and analyses completed by its senior author for all 11 District dams.

3) The report is intended to act as a reference document for future engineers and geologists at the District involved with dam safety.

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What's in the DSP Report? (1)

The report includes an Executive Summary and four chapters including:

1) An in-depth description of the District,
2) A brief history of dams and dam regulations in the U.S.,
3) An in-depth description of the Dam Safety Program, and,
4) A discussion of the staffing and cost estimates for implementing the DSP.

What's in the DSP Report? (2)

2)There are nine appendices including:

A. Dam Statistics
B. Cultural and Construction History of District Dams
C. Geologic and Seismic Issues at District Dams
D. Post-earthquake Inspection Program
E. Geotechnical Considerations for Earth Dams
F. Automated Data Acquisition Systems
G. Dam Instrumentation Concepts
H. Preliminary Instrumentation Design for 10 dams
I. Pertinent Technical References for District Dams.

District System

As the water resources management agency for Santa Clara County, the District manages:

- 10 reservoirs;
- 19 groundwater recharge facilities;
- 3 water treatment plants;
- 3 pumping stations;
- hundreds of miles of rivers, creeks, and other waterways,
- an extensive water distribution system of major pipelines that connects sources of imported water, reservoirs, water treatment plants and retailers.

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District Dams

The District owns and operates 10 in-stream dams and reservoirs as part of its water utility system. The original six dams were designed in 1934/35 and constructed in 1936. These included Almaden, Calero, Coyote, Guadalupe, Stevens Creek, and Vasona. Anderson and Lenihan dams were built by the District in the 1950s. Uvas and Chesbro dams, both built in the 1960s, were acquired by the District in the 1980s. The treated water reservoir operated at Rinconada WTP is also under DSOD jurisdiction.

DSP Justification (1)

Dams must safely withstand the enormous forces developed by the impounded water in their reservoirs for many years. It is vitally important for the District to implement a formal dam safety program in order to protect against:

1) Potential loss of life;
2) Potential destruction of property;
3) Damage to public welfare; and,
4) loss of benefits of dam ownership.

vs. risk of flooding.

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DSP Justification (2)

Statistically, there is a chance of failure of about 1 in 10,000 averaged over its life that a well-built dam will fail in any one year. For the District's 10 dams, a simplistic risk analysis would indicate that there is a chance of about 1 in 1,000 that at least one of our dams could fail in a given year.

From a probability standpoint, for every billion dollars of potential damage due to dam failure, the annual risk cost from the ten dams is about $1,000,000 (probability of failure times consequences).

DSP Justification (3)

Evidence suggests that an effective performance and full time monitoring (instrumentation) program, such as proposed in the DSP, can reduce the probability of failure by as much as 90%. This means that an effective monitoring program, which includes detailed instrumentation, could decrease the annual risk potential of the 10 dams by as much as $900,000 for every billion dollars of potential damages.

DSP Activities (1)

drawdown failure risk
(>1ft/day)

anderson: only dam
not subject to
drawdown
failure b/c
of rock-fill

- All dams to be operated in a reasonable manner;
- All dams to be maintained in a safe and non-defective condition to prevent degradation;
- All dams to have a planned maintenance program;
- Individual dam maintenance records will be managed and maintained by Maintenance;

DSP Activities (2)

- All dams will be inspected at least once per year by District personnel;
- All dams and their foundations will be well ✓ instrumented;
- All dams will have a series of crest monuments surveyed on a regular basis; (dates back to 1936)
- Surveillance reports summarizing instrumentation monitoring will be prepared for regulatory compliance once per year;

DSP Activities (3)

- Emergency Action Plans for all dams will be prepared, maintained and updated every five years;
- The Earthquake Preparedness Program will be staffed by volunteers and maintained by the Dam Safety Section and the Office of Emergency Services
- All dams will have their static and dynamic analyses performed once every 5-10 years, or more often as appropriate.

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DSP Activities (4)

probable maximum precipitation

probable maximum flood

- All dams will have their PMP and PMF scenarios evaluated and reviewed once per 5-10 years.
- The implementation of 24/7 GPS techniques for use in surveying ground movements should be evaluated for several of our dams.
- All dams will have a Failure Mode Analysis performed once every 5-10 years, or more often as appropriate.

DSP Activities (5)

The District will maintain a well-staffed Dam Safety Section whose responsibility it will be to:

- monitor the instrumentation and automation systems and prepare timely summary reports to management;
- assist in the development and monitoring of the dam maintenance program;
- schedule and assist in dam safety inspections;
- maintain the E/Q Preparedness Program;
- perform as the principal District contact for dam regulatory agencies.

Environmental and CEQA Concerns for the DSP (1)

1) The District dams, by virtue of their locations, tend to be in natural, aquatic and vegetated environments that are natural habitat for wildlife.
2) Typical dam safety and dam maintenance practice is to maintain the entire footprint of the structure free of unwanted vegetation and growth and to maintain the dams in their "as-built" condition.

Environmental and CEQA Concerns for the DSP (2)

3) District environmental staff has taken the position that we should perform environmental due diligence (complete CEQA documents and obtain permits) for our dam maintenance activities.

4) The CEQA requirements referenced in (3) above are dramatically affecting our ability to perform dam maintenance.

affects dam
maintenance
activities

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Environmental and CEQA Concerns for the DSP (3)

5) District environmental staff advised grouping of typical activities into a Programmatic EIR for dam maintenance, similar to the Stream Maintenance Program. This activity is budgeted to start in FY2004 and is expected to require 3 to 4 years to complete.

Dam Maintenance Oversight (1)

1) Staffing and budgeting are significant problems from an operational and environmental point of view.

2) The budget for performing dam maintenance activities currently lies with the Utility Maintenance Unit; however, no one in the unit is assigned the responsibility for overseeing, coordinating and tracking the activities.

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Dam Maintenance Oversight (2)

3) It is recommended that a full time position be assigned to the Dam Safety Section to provide monitoring, oversight, and tracking for maintenance.

4) It is possible that DSOD will impose reservoir operation restrictions on the District due to lack of proper dam maintenance.

Dam Instrumentation Project

The Dam Instrumentation Project (DIP) is a major component of the DSP. Completion of the ER and CEQA documentation for the DIP is currently underway. The DIP is currently scheduled to be completed over a 5-year period that will begin in 2004 and will involve completing the instrumentation of 2 dams per year. When finished, the DIP, a one time effort, will have been successful in installing the following number of instruments in the District's 11 dams:

Electronic piezometers – 214
Electronic inclinometers 11
Accelerometers – 7

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Estimated Cost for Dam Instrumentation Project

Total Cost of Instrumentation	$3,538,000
Final Design and Prep. of Plans & Specs	$708,000
Construction Management	$354,000
Contingency (15%)	$690,000

CEQA

Total cost for DIP	$5,300,000*

*Estimated cost will be updated by completion of the Engineers Report.

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Recommended Staff Additions

The implementation of the DSP will require staff additions in order to successfully implement the program. The current forecast (2004-2009) is as follows:

- Program Administrator – to manage the dam maintenance program
- Assistant Civil Engineer – to manage automated DIP and complete monitoring analyses
- Assistant Eng'r Geologist – to augment geological requirements of DSP program
- Office Specialist – to maintain files and prepare instrumentation reports.

One (1) position is proposed for the 2005 budget

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